

Electrochemical behaviour of Oxygen Plasma ion implanted NiTi alloy for Biomedical Applications

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Abstract

Nickel-titanium alloy (Nitinol - NiTi) has attractive and unique properties such as super elasticity and shape memory effect and it is used in orthopaedic and orthodontic applications. However NiTi releases harmful Ni ions from the implants to living tissues that could be toxic to cell, tissue and organs. Therefore, it is essential to have a barrier for such release of ions from the implant. In this work, NiTi alloy was implanted with oxygen ions by plasma immersion ion implantation (O-PIII). The surface was characterized by FESEM and EDS. The corrosion behavior of the treated and untreated samples was investigated through electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization studies in simulated body fluid (Hanks' solution). The investigation of the samples showed the formation of a thin oxide layer on the coated samples. Corrosion resistance of the oxygen implanted sample shows better corrosion resistance compared to that of untreated samples. Electrochemical impedance data of the substrate and treated samples were fitted with two time constant equivalent circuits.

Keywords: Nitinol, Plasma immersion ion implantation, Corrosion

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